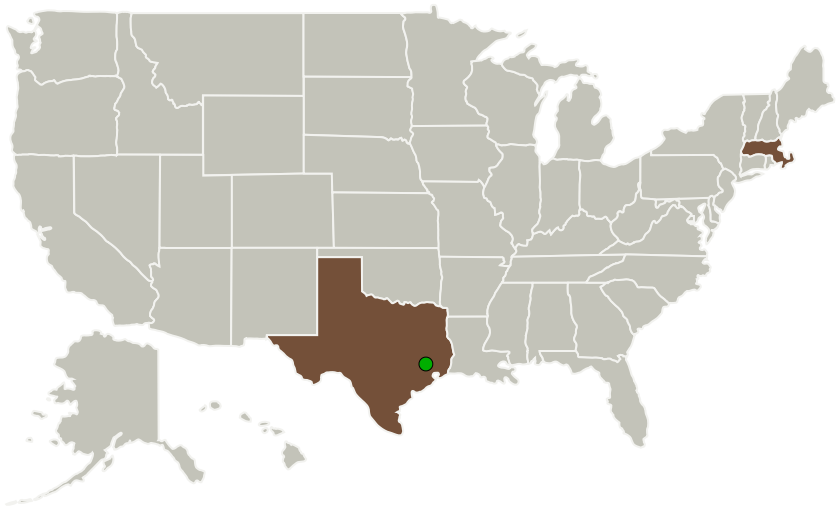
Novel Conductive Water Removal Membrane (CWRM) for PEM Passive Fuel Cell Operation, Phase II

Completed Technology Project (2011 - 2013)

Project Introduction

ElectroChem proposes a Phase II program to advance its Phase I effort, to develop a conductive water removal membrane to enable passive, high current density PEMFC operation. Very good progress was demonstrated by the two approaches investigated: 1) Construct a carbon-based composite, higher bubble point membrane; 2) convert a polymer-based water removal membrane to a conductive membrane (both approaches to meet the CWRM primary requirements of conductivity, water permeation, and "no gas leakage"). In Phase I, coating the carbon with conductive/hydrophilic materials was very effective, resulting in CWRM's that met the conductivity and water permeation requirements and reduced gas permeation by 99.8%. A multilayer variation achieved "no gas permeation" at 40 psig. In the polymer approach, conductive material treatments were successful in increasing conductivity. In Phase II, we will 1) use quantitative control of the carbon coatings to advance the promising carbon composite approach; 2) utilize individual layers with different properties to construct a multilayer CWRM; 3) investigate the use of a conducting polymer to increase bubble pressure. To produce a polymer-based CWRM, an advanced pore modification technique will be used to enhance polymer acceptability of the conductive particles. The program will culminate with fuel cell testing of the CWRM's.

Primary U.S. Work Locations and Key Partners



Novel Conductive Water Removal Membrane (CWRM) for PEM Passive Fuel Cell Operation, Phase II

Table of Contents

Novel Conductive Water Removal Membrane (CWRM) for PEM Passive Fuel Cell Operation, Phase II

Completed Technology Project (2011 - 2013)

Organizations Performing Work	Role	Type	Location
ElectroChem, Inc.	Lead Organization	Industry Minority-Owned Business, Women-Owned Small Business (WOSB)	Woburn, Massachusetts
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Massachusetts	Texas

Project Transitions

June 2011: Project Start

December 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139180)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ElectroChem, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Shyhing Pien

Co-Investigator:

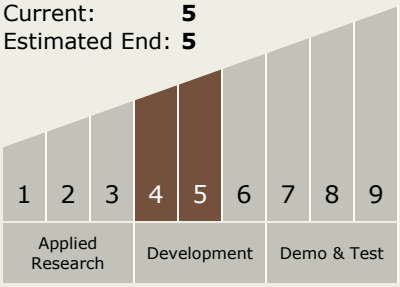
Michael Pien

Novel Conductive Water Removal Membrane (CWRM) for PEM Passive Fuel Cell Operation, Phase II

Completed Technology Project (2011 - 2013)

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.4 Dynamic Energy Conversion

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System